

What is claimed is:

1. A movable barrier operator operable from alternating current comprising:

an electric motor;

5 a transmission connected to the motor to be driven thereby and to the movable barrier to be moved;

an electric circuit for detecting AC line voltage and frequency of the alternating current;

a worklight;

10 a first set of operational values for operating the worklight, when a first AC line frequency is detected;

a second set of operational values for operating the worklight, when a second AC line frequency is detected; and

15 a controller, responsive to the detected AC line frequency, for activating the corresponding operational set of values for operating the worklight.

2. A movable barrier operator operable from alternating current according to claim 1 wherein the

20 first AC line frequency comprises 50 Hz and the first set of values comprises a first shut-off time and the second AC line frequency comprises 60 Hz and the second set of values comprises a second shut-off time.

3. A movable barrier operator operable from alternating current according to claim 2 further comprising a routine for controlling motor speed and wherein the first set of values further comprises a scaling factor for scaling the motor speed.

4. A movable barrier operator operable from alternating current according to claim 3 wherein the scaling factor is stored in a look-up table stored in a memory.

5. A movable barrier operator operable from alternating current according to claim 2 wherein the first shut-off time comprises about two and one half minutes and wherein the second shut-off time comprises

5 about four and one half minutes.

6. A movable barrier operator having linearly variable output speed, comprising:

an electric motor having a motor output shaft;

a transmission connected to the motor output shaft

10 to be driven thereby and to the movable barrier to be moved;

a circuit for providing a pulse signal comprising a series of pulses;

15 a motor control circuit responsive to the pulse signal, for starting the motor and for determining the direction of rotation of the motor output shaft; and

20 a controller for controlling the length of the pulses in the pulse signal in accordance with a predetermined set of values, wherein in accordance with the predetermined set of values, a speed of the motor is linearly varied from zero to a maximum speed and from the maximum speed to zero.

7. A movable barrier operator according to claim 6, wherein the predetermined set of values causes

25 incrementing of the motor speed from zero to a maximum motor speed in a plurality of steps, causing the motor to operate at the maximum speed for a predetermined period of time, then decrementing the motor speed from the maximum speed to zero in a plurality of steps.

30 8. A movable barrier operator according to claim 7 wherein each step comprises a value corresponding to about five percent of a maximum speed of the motor.

49. A moveable barrier operator according to claim
16 wherein the motor control circuit comprises:

1 a first electromechanical switch for causing the
motor output shaft to rotate in a first direction;

5 a second electromechanical switch for causing the
motor output shaft to rotate in a second direction; and

10 a solid state device responsive to the pulse signal,
for providing current to the motor to cause it to rotate.

50. A movable barrier operator according to claim 49
10 wherein the first and second electromechanical switches
comprise relays and the solid state device comprises an
FET.

11. A movable barrier operator which automatically
detects barrier size, comprising:

15 an electric motor having a maximum output speed;

20 a transmission connected to the motor to be driven
thereby and to the movable barrier to be moved;

a position detector for sensing the position of the
barrier with respect to a frame of reference; and

25 a controller, responsive to the position detector,
for calculating a time of travel between a first barrier
travel limit and a second barrier travel limit and
responsive to the calculated time of barrier travel, for
automatically adjusting a barrier travel speed.

30 12. A movable barrier operator according to claim
11 wherein the barrier comprises a segmented panel door
and wherein the controller adjusts the barrier travel
speed such that a maximum barrier travel speed is based
on one hundred percent of the motor's maximum output
speed.

13. A movable barrier operator according to claim
11 wherein the barrier comprises a single panel door and

wherein the controller adjusts the barrier travel speed such that a maximum barrier travel speed is based on percentage less than one hundred percent of the motor's maximum output speed.

5 14. A movable barrier operator according to claim 12 further comprising a routine for varying the motor speed in accordance with a predetermined set of values, wherein in accordance with the predetermined set of values, a speed of the motor is linearly varied from zero to a maximum speed and from the maximum speed to zero.

10 15. A movable barrier operator according to claim 13 further comprising a routine for varying the motor speed in accordance with a predetermined set of values, wherein in accordance with the predetermined set of values, a speed of the motor speed is linearly varied from zero to the motor's scaled output speed and from the motor's scaled output speed to zero.

15 16. A movable barrier operator having full closure, comprising:

20 an electric motor;
 a transmission connected to the motor to be driven thereby and connectable to a movable barrier to be moved;
 a position detector for sensing a position of the barrier;

25 a learn routine for determining a minimum reversal position of the barrier relative to a close limit, wherein the minimum reversal position of the barrier position is located a short distance above the close limit;

30 a controller responsive to the position detector and to a close command to move the barrier to the close limit, for controlling the motor, wherein when the position detector senses the position of the barrier at

the minimum reversal position, the controller causes the motor to continue to operate for a predetermined period of time prior to shutting off the motor, effective for driving the barrier to the close limit.

5 17. A movable barrier operator according to claim 16 wherein the electric motor comprises a DC motor.

18. A movable barrier operator according to claim 16 wherein the electric motor comprises an AC motor.

10 19. A movable barrier operator according to claim 16 wherein the minimum reversal position is located approximately one inch above the close limit.

20. A movable barrier operator according to claim 16 wherein the close limit corresponds to a location of a floor.

15 21. A movable barrier operator having automatic force settings, comprising:

an electric motor;

a transmission connected to the motor to be driven thereby and connectable to the movable barrier to be moved;

a circuit for providing a pulse signal comprising a series of pulses;

a motor control circuit, responsive to the pulse signal, for starting the motor and for determining the direction of rotation of the motor output shaft;

a first force command device for setting a first force limit for use when the motor is rotating in a first direction;

30 a second force command device for setting a second force limit for use when the motor is rotating in a second direction; and

5 a controller responsive to the first force limit and to the second force limit for varying the length of the pulses in the pulse signal, effective for varying the motor speed during travel in the first direction and in the second direction.

10 22. A movable barrier operator according to claim 21 wherein the barrier comprises a door having a pedestrian door and the operator further comprises a sensor for detecting the position of the pedestrian door, wherein the controller, responsive to the pedestrian door sensor detecting the pedestrian door is not closed, disables movement of the barrier.

15 23. A moveable barrier operator according to claim 21 wherein the motor control circuit comprises a first electromechanical switch for causing the motor output shaft to rotate in the first direction, a second electromechanical switch for causing the motor output shaft to rotate in the second direction and a solid state device responsive to the pulse signal, for providing current to the motor to cause it to rotate.

20 24. A movable barrier operator according to claim 21 wherein the first force command device comprises a force potentiometer for generating a first analog force signal and the second force command device comprises a force potentiometer for generating a second analog force signal.

25 25. A movable barrier operator according to claim 24 further comprising a first A/D converter for converting the first analog signal to a first digital signal and a second A/D converter for converting the second analog signal to a second digital signal.

26. A movable barrier operator according to claim
25 further comprising a look-up table comprising a
plurality of motor speeds stored in a memory in the
controller, wherein responsive to the first digital
5 signal and the second digital signal selects a
corresponding motor speed stored in the look-up table.

27. A movable barrier operator having a flasher
module, comprising:
10 an electric motor;
a transmission connected to the motor to be driven
thereby and connectable to a movable barrier to be moved;
a flasher module light;
a flasher routine for enabling and disabling the
15 flasher module light in a predetermined pattern;
a controller, responsive to a command to move the
barrier, for controlling the motor and for automatically
detecting the presence of the flasher module light,
wherein responsive only to the presence of the flasher
module light, the controller executes the flasher routine
20 and delays starting the motor for a predetermined delay
time.

28. A movable barrier operator according to claim
27, wherein the flasher routine continues until the
controller causes the motor to stop.

25 29. A movable barrier operator according to claim
27 wherein the predetermined delay time comprises about
two seconds.

30 30. A movable barrier operator according to claim
27, wherein the flasher routine continues only during the
predetermined delay period.